

LER Control and Mitigation: Mask roughness induced LER aberrations sensitivity study and alter illumination scheme

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In the push towards commercialization of extreme ultraviolet lithography (EUVL), meeting the stringent requirements for line-edge roughness (LER) is increasingly challenging. The extent to which aberrations effect mask roughness induced LER is not yet well understood. Here we conduct a mask roughness induced LER aberrations sensitivity study on the printing of features using the prime illumination candidates for both the 22-nm and 16-nm half pitch nodes with the goal of providing LER control guidelines. Full 2D aerial image modeling for an imaging system with $NA=0.32$ was done for features on a rough mask with a replicated surface roughness (RSR) of 100 pm and a correlation length of 32 nm. We further considering an alternative source shape to provide LER mitigation for the 16-nm node; namely, a dipole that is extended to represent a strip. Preliminary results show that while this illumination provides nearly the same LER as a conventional dipole illumination, overall imaging quality in terms of ILS, NILS, and contrast is improved.

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